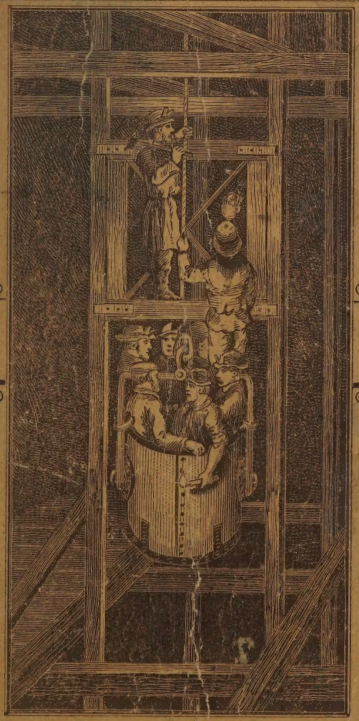
THE HOOSAC



COMMENCED
1851

COMPLETED
1876

MINERS DESCENDING THE SHAFT.

HOOSAC TUNNEL TRI-NITROGLYCERINE WORKS,

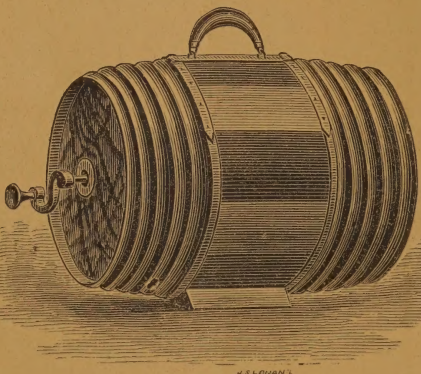
GUTTA PERCHA FACTORY, and all the Materials for economic Blasting,

NORTH ADAMS, MASS.

GEO. M. MOWBRAY, . . . Proprietor.

Mowbray's Powder-Keg Blasting Battery and Electric Fuse Exploders.

Sub-Marine Exploders.



Section of Exploder.

REFERS TO

WALTER SHANLY, Esq., MONTREAL.

FRANCIS SHANLY, Esq., TORONTO.

W. KINGSFORD, Esq., Engineer in charge Western Lakes and Harbors, OTTAWA.

H. SUTHERLAND, Esq., Supt. Public Works, North West Territories, OTTAWA.

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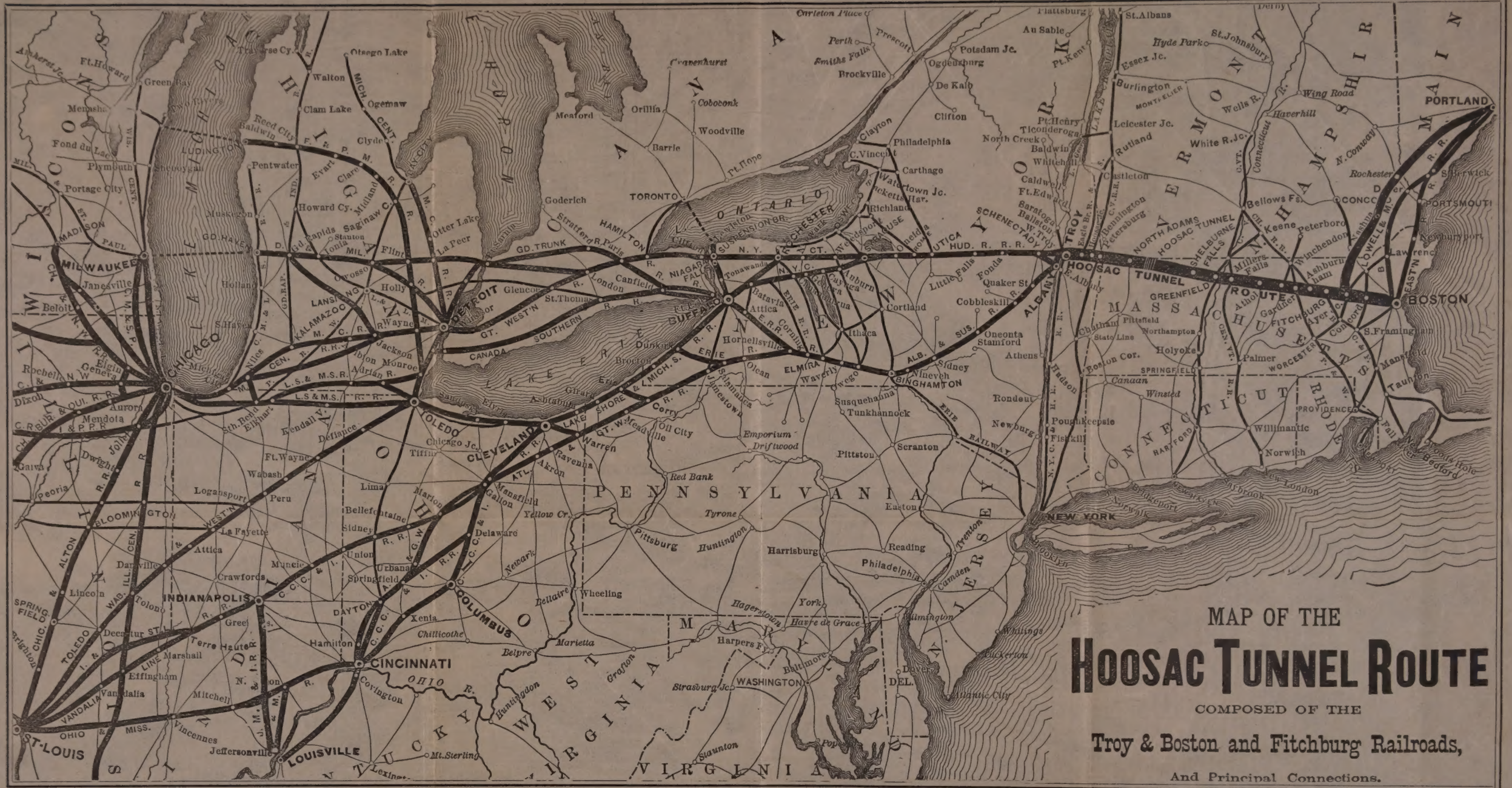
JOS. WHITEHEAD, Contractor Sect. 15, C. P. R. R. WINNEPEG.


MAP OF THE
HOOSAC TUNNEL ROUTE
COMPOSED OF THE
Troy & Boston and Fitchburg Railroads,
And Principal Connections.
CHICAGO
MILWAUKEE
DETROIT
BUFFALO
TORONTO
CLEVELAND
TOLEDO
INDIANAPOLIS
COLUMBUS
CINCINNATI
ST. LOUIS
LOUISVILLE
NEW YORK
BOSTON
PORTLAND
ALBANY
TROY
HOOSAC TUNNEL
GREENFIELD
FITCHBURG
WORCESTER
SPRINGFIELD
HARTFORD
PROVIDENCE
BINGHAMTON
PENNSYLVANIA
MARYLAND
VIRGINIA
WASHINGTON
Baltimore
Harrisburg
Philadelphia
Pittsburg
Scranton
Reading
Trenton
Camden
Atlantic City
Wheeling
Harpers Ferry
Hagerstown
Harre de Grace
Chicago Jc.
Fort Wayne
Lake Shore & Mich. S. R.R.
Grand Trunk R.R.
Canada Southern R.R.
Erie R.R.
New York Central & Hudson River R.R.
Delaware, Lackawanna & Western R.R.
Pennsylvania R.R.
Baltimore & Ohio R.R.
Chesapeake & Ohio R.R.
Cincinnati, Indianapolis, St. Louis & Chicago R.R.
Ohio & Mississippi R.R.
Louisville & Nashville R.R.
Lake Champlain
Lake Ontario
Lake Erie
Ohio R.
Connecticut R.
Hudson R.
Susquehanna R.

TF 238.H7 M3 1878
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HISTORY

OF THE

HOOSAC TUNNEL.

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BOSTON:
ALFRED MUDGE & SON, PRINTERS,
No. 24 SCHOOL STREET.
1878.

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HOOSAC.

COMMENCED, 1851. — COMPLETED, 1876.

A ROYAL pathway has at last been made, five miles in length, through Hoosac Mountain, by the Commonwealth of Massachusetts, by which New England may more readily receive the products of the farms and mines of the West and North, and send in return the productions of her vast and numerous manufactories.

The reader can get something of an idea of the immense amount of work necessary to accomplish this great undertaking from the fact that more than a million tons of rock have been excavated, and, in portions of the tunnel where arching became necessary, more than twenty millions of brick were used in its construction.

At seven minutes past three o'clock on the afternoon of Nov. 27, 1873, the final blast between the two headings of the Hoosac Tunnel was fired, and an opening eight feet square was made between the Central and Western Sections. Thus an uninterrupted passage was effected through Hoosac Mountain. Long years of weary toil, untiring perseverance, and extraordinary engineering skill were this day crowned with success; and, as the deafening thunder from the explosion died away, a shout announcing the successful opening between the headings rang from the crowds assembled in the sections. The wildest enthusiasm prevailed; a headlong rush followed, each eager to be the first that should step through the opening. An event of such importance, both from a commercial and engineering point of view, deserves a careful and extended account; although to write a history of the Hoosac Tunnel in all its details would be an almost endless task. The legislative bills and hearings, the reports of committees, remonstrances and private pamphlets on the subject, if stacked up in an orderly pile, would rival the size of the mountain itself.

The Hoosac Mountain is a part of the Green Mountain range,

extending through the western part of Massachusetts, and has, up to the time of the opening of the tunnel, formed a natural barrier between the States of Massachusetts and New York. The tunnel was first proposed in 1819, but at this time nothing of importance was done. In 1825, a board of commissioners was appointed by the legislature to select a route for a canal extending from Boston to the Hudson River; in 1826, they reported favorably, stating that no unusual difficulties presented themselves excepting the tunnelling of the mountain. But the first railroad in America, built in 1825, having been put in operation and proved a success, the canal project was abandoned. The idea of tunnelling the mountain, however, was not entirely given up. In 1842, the Boston and Albany Road was completed. This road was built, running over the mountain, about twenty miles south of the tunnel line. It was constructed on grades unequalled in the history of railway building up to that time, and owing to this fact, the running expenses and tariffs were and are still necessarily very high. Boston capitalists were not satisfied; and, from time to time, the subject of building a more direct route between Boston and the West, to compete with the Boston and Albany Road, was agitated. In 1843, the Fitchburg Road, running through the northern part of the State, was completed, and the Vermont and Massachusetts, which is a continuation of the Fitchburg to Greenfield, was completed about three years after. In 1848, a railroad company, known as the Troy and Greenfield, was incorporated for the purpose of constructing a road from a point at or near Greenfield, through the mountain, to Williamstown, there to connect with a road leading to or near the city of Troy, N. Y., thus forming, with the Fitchburg and Vermont and Massachusetts, another through line to the West. It was comparatively an easy road to build, except for the great mountain barrier that separated the valleys of the Deerfield and Hoosac. One of the most important questions which arose when the tunnel was projected concerned the geological character of the mountain. Prof. Edward Hitchcock, of Amherst College, who had been studying the formation of the Hoosac for many years, came before the legislative committee, and gave his opinion, — said that he had been examining the mountain with special reference to a tunnel, and, in his opinion,

there would scarcely anything else be found but mica slate, with occasional seams of quartz. The ground, he thought, would be found easy to drill, and that but very little would be encountered which would require arching. The prognosis of Prof. Hitchcock was, in most particulars, found strikingly correct. It was modified in some respects, however, as at the west end a new and unexpected formation was encountered, occasioning much delay and a heavy additional expense.

The reader will notice, by referring to the profile of the mountain, that, directly above the tunnel, there are two summits, with a wide valley intervening, the west summit being 1,718 feet above the tunnel, the east 1,429 feet. A great portion of the line over the mountain is covered with forests, the earth averaging about ten feet deep. In portions of the valley, the land is swampy. The rock through which the tunnel passes is principally mica slate, with occasional veins of quartz. Now and then, in portions of the tunnel, rock was encountered which could not be distinguished from granite and often exceeded it in hardness.

The stratification dips eastward at an angle of from sixty to eighty degrees from the horizontal, changing two miles from the east end to a dip of from twenty-two to thirty degrees, which continues for the next half or three quarters of a mile. At this point the dip changes to the westward and lies at an angle of from twenty to thirty degrees.

In 1851, work was first begun on the tunnel with a ponderous and costly boring machine, with which it was the intention of the company to cut or bore a hole through the mountain the full size of the tunnel. This, together with other machines of a similar character which were tried, proved a failure; and the company, finding the undertaking more formidable than had been imagined, ceased work until 1854. At this time, the State voted a loan of $2,000,000, and took a mortgage on the company's property. The work went slowly on until 1861, when the funds gave out; and, in 1862, the State foreclosed its mortgage at the desire of the company. Commissioners were then appointed by the State to prosecute the work, and made new appropriations. After six years' management by Commissioners, the legislature, weary of making constant appropriations and seeing small

results, authorized the governor and Council to make a contract with some one for the entire work of completing the tunnel. Soon after, a contract was made with Messrs. F. Shanley & Co., of Montreal. Up to this time, —January, 1869, —the amount of work done by various contractors and State Commissioners was as follows: East end, advanced 5,283 feet; west end, 4,055 feet; west shaft sunk to grade, 318 feet; central shaft sunk to a depth of 583 feet. Thus it will be seen that up to this time but little more than one third of the work necessary for the completion of the tunnel had been done; and the actual amount of money expended by the State and contractors thus far, not reckoning interest, was more than $7,000,000.

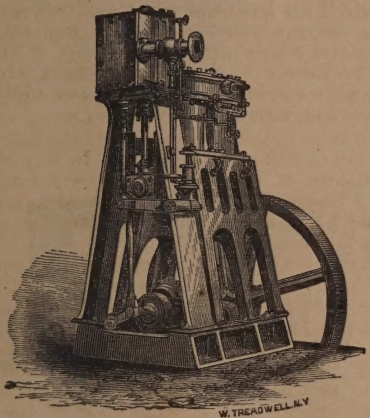
The contract made with the Messrs. Shanley required them to complete the tunnel, of which there still remained to be opened 15,743 feet, the central shaft to be sunk to grade, a depth, in addition to what had already been done, of 445 feet, for the sum of $4,594,268. Under this contract, the work was successfully and vigorously prosecuted. Obstacles and difficulties, even greater than any that had heretofore been encountered, through the indomitable energy and perseverance of the contractors, were overcome, and on Feb. 9, 1875, the first train of cars passed through Hoosac Mountain.

WRITTEN TWENTY-FIVE YEARS AGO BY OLIVER WENDELL HOLMES.

. . . . . .

When publishers no longer steal,
And pay for what they stole before;
When the first locomotive wheels
Roll through the Hoosac Tunnel bore, —
Till then let Cummings blaze away,
And Millers' saints blow up the globe;
But when you see that blessed day,
Then order your ascension robes.

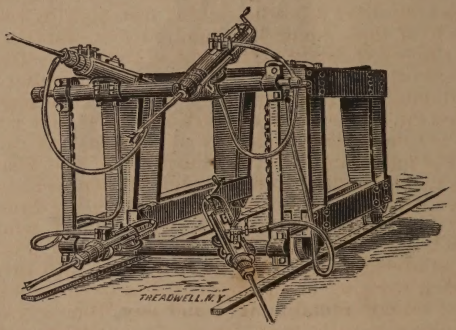
Up to 1865, the drilling had been done by hand power, and ordinary black powder used in blasting, by which means the tunnel advanced but slowly. About this time, the Commissioners became interested in machine drills driven by compressed air, they at this time being successfully used on the Mount Cenis Tunnel, which was being built under the Alps, between Italy and France.



BURLEIGH AIR COMPRESSOR.

The Deerfield River, a stream which flows down through the Deerfield Valley, passing near the eastern entrance of the tunnel, was dammed at a point three quarters of a mile above, and the water brought by canal, with a fall of thirty feet, to within a short distance of the tunnel. It was at first thought that sufficient power could be obtained at this point necessary to run the drilling machines and other machinery used in carrying on the work at the east end, central shaft, and the west end. The air compressors being located at the east end, it was proposed to run a line of iron pipes from them, over the mountain, to the central and west-end sections, through which to convey the compressed air, thereby supplying power necessary to carry on the work at these points. The dam supplied, however, sufficient power for the east-end work only; and, at the central and west-end sections, steam power was employed. The drilling machine first used in 1866 was complicated, costly, and failed to do the work. A short time afterward, a company was formed, known

as the Burleigh Rock Drill Company, at Fitchburg, Mass., who perfected a machine which was lighter, less expensive, more easily repaired, and proved far more effective. In the headings, eight drilling machines were kept constantly at work, except when the men were employed in blasting and clearing away the rock. They were mounted on



DRILL CARRIAGE.

frames, or what were more commonly termed a drill carriage on wheels, two of which were used, each mounting four drills. The machine consisted simply of a cylinder and piston, the drill being fastened to the end of the piston, which moved back and forth in the cylinder, propelled and operated by compressed air, like the piston of an ordinary steam-engine. They were arranged on the carriages so as to be easily adjusted to any angle, thereby enabling the miner to drill a hole in any direction desired. A hole from four to five feet deep could be put down in one hour. One of the machines used in the west heading was at one time kept running for a period of three months without repairs, during which time the total depth of holes drilled was equivalent to one hole a mile in length and two inches in diameter. This remarkable fact is, no doubt, owing in a great measure to their simplicity of construction.

The air, after being compressed, was taken into a tank or air chamber, and from this conveyed into the tunnel through iron pipes about twelves inches in diameter, on which the pressure was from fifty-five to sixty pounds to the square inch, connection between the permanent iron pipes and drills being made by a rubber pipe, which could be easily disconnected when the drill carriages were to run back for a blast. The method of construction was to drive a heading eight feet high by twenty-four wide. Back of this, some five hundred feet, another gang of men were employed enlarging the tunnel to its full size, twenty-two by twenty-four. Thus, it will be seen, by keeping the heading several hundred feet in advance of the enlargement, that nearly twice the number of men were employed that could have been had the tunnel been made full size as fast as carried forward into the mountain. During the time of the Shanley contract, from eight hundred to nine hundred men were employed, five hundred being kept constantly at work in the tunnel. The tunnel men consisted of two classes,—the miners, who did the drilling, and the "rock men," whose business it was to clear away rock after blasting. They were divided into three gangs or shifts, each working eight hours in the twenty-four. Work was carried on continually, night and day, Sundays excepted. In the headings, usually from ten to fifteen holes were drilled and blasted during a shift. As I have before stated, up to 1865 the principal explosive — in fact, the only one — used was the ordinary black powder; but about the time that machine drilling was being introduced in 1866, experiments were being made with nitro-glycerine. It was used but a short time. Later, in 1867, Prof. George M. Mowbray, a gentleman who had about this time become considerably interested in this explosive, came to North Adams at the request of the commissioners, they having become fully convinced, from experiments that had already been made, that double the progress could be made with glycerine over that with powder, and at a less cost. A contract was made with Mr. Mowbray to supply glycerine for the work, and in December, 1867, a factory was completed for its manufacture near the west shaft. From early in 1868 up to the completion of the tunnel, more than a half-million pounds of this powerful explosive were used. I would here state that the explosive invented and man-

ufactured by Prof. Mowbray is known as tri. nitro-glycerine, and is still being manufactured by him at North Adams. Men were employed, — usually three on each shift, — called "blasters." After the holes were drilled, the glycerine was brought into the tunnel by them from the magazine in copper cans, and from these poured into tin tubes, about two inches in diameter, varying in length according to the depths of the holes drilled, they varying in depth from eight to twelve feet. In a hole ten feet deep, a cartridge or tube, from three to four feet long, would be inserted, containing three pounds of glycerine. Into the end of each cartridge an electric fuse or exploder was inserted, to which were attached connecting wires. After loading the holes, the wires running from each were then connected with the leading wires, after which the blasters, retiring back some three hundred or four hundred feet, would connect the leading wire with a friction electric machine, from which a spark of electricity, sent over the wires, exploded all the charges simultaneously. After the introduction of glycerine, numerous experiments were made with other new explosives, all of which failed to do the required work. The number of accidents attending its use were considerably less in proportion than during the time that ordinary powder was used.

The number of lives lost during the whole time foot up a total of one hundred and thirty-six, which, when one considers the magnitude of the work, the time occupied in its construction, and the number of men to whom it gave employment, was comparatively small, as, during the construction of the Mount Cenis Tunnel, nearly one thousand lives were sacrificed. One of the saddest accidents on the Hoosac took place at the central shaft, Oct. 19, 1865. Some time previous to this, experiments had been made with an apparatus for lighting the shaft with gasoline, but being considered unsafe, its use was abandoned. New contractors took hold of the tunnel work at this time, and were trying to utilize the old apparatus, when the gasoline, confined in a tank near the engine, took fire from a lamp. The flames, spreading rapidly, drove the engineer from his post. Then all chance for the thirteen poor fellows below to be hoisted to the surface was cut off. All the buildings over the shaft were soon in flames. Tons of steel drills, together with burning timbers,

were precipitated into the shaft, no doubt killing many of the men outright, while the remainder were probably either suffocated or drowned by the rapidly rising water. The shaft at this time had been sunk to a depth of five hundred and eighty-three feet. The following day, a brave miner — Tom Mallory by name — was lowered into the shaft, but was soon hauled to the surface in an insensible condition. He recovered after a short time, reported from fifteen to twenty feet of water in the shaft, but no traces of the unfortunate miners. Work at this point was abandoned for a year, after which it was resumed, the shaft, in the mean time, having filled withwater nearly to the top. This was pumped out, the bodies recovered, a few of which were identified. Altogether, twenty-four lives were lost in this part of the work.

It is in connection with this sad side of the work that I would especially speak of the contractors, Messrs. Shanley; for here they have shown a tender and sympathetic care for the sufferers seldom seen. I have been informed that, during the time they were connected with the work, the total amount of money expended for the relief of the sufferers reaches nearly $10,000.

The central shaft, which is located near the centre of the tunnel, as will be seen by referring to the Profile, is 1,028 feet deep. Work was first begun here in December, 1863. The chief advantage that was expected to be derived from this was that it would serve as a ventilator to the tunnel, and it was also thought it could be sunk in time to be of great use in expediting the work; as, after being sunk to grade, two more headings would be afforded from which to work the tunnel. As a ventilator, some are of the opinion that it is of no practical value; others that it is. After sinking it to the tunnel grade, going west an advance was made of 2,006 feet; going east, 1,563, — thus undoubtedly shortening the time of construction of the tunnel some few months.

The Messrs. Shanley were obliged to put in a pumping system, at an expense of $80,000 or more, to carry off the immense amount of water that flowed in; and, taking into consideration the expense of sinking, it is a question whether its great cost was money wisely expended. The west shaft, which is now partly filled, is located 2,500 feet from the west portal. At the

western entrance, the engineers and contractors had to contend with great, in fact, almost insurmountable difficulties. Rock, termed mica schist, was encountered here, which, by the action of air and water, formed what was called "demoralized rock" or porridge. This could not be depended on for walls or roof. Consequently, through this ground, which extended in some 2,000 feet, it was found necessary to construct a brick arch, twenty-six feet wide by twenty-four high, varying in thickness from seven to twelve courses. The progress, at this point, was necessarily very slow; and, to facilitate the work, it was deemed advisable to sink the west shaft. They reached grade in 1861. Finding the rock firm at this point, the tunnel was pushed westwards towards entrance and eastwards under the mountain. Mules were lowered down the shaft, where they remained some four years, and were employed in hauling loaded cars from the headings to the shaft, where the cars were run into cages and hoisted to the surface by machinery above.

To one not acquainted with the principles or details of engineering as applied to tunnels, it is difficult for them to understand how a tunnel of five miles in length could be worked from either end so accurately that the holes projected should exactly meet. After the main line is located, the methods adopted for keeping the men working in at the ends on this line are much more simple than one would at first suppose. The reader will notice by referring to the Profile, as I have before stated, that directly over the tunnel there are two summits. When the tunnel was determined upon and the surveys made, upon each summit was built, in solid masonry, what were called "signal houses." From the top of these were erected iron poles, fifteen feet in height, two inches in diameter, these being placed exactly on the proposed tunnel line. By the use of a transit instrument having a powerful telescope, a straight line was drawn from one of these poles to the other. Eastward, this line was extended beyond the proposed east portal, across the Deerfield River, to a point on the hill beyond, known as Row's Head, where another pole was erected. Westward, in the same manner, this line was extended across the Hoosac Valley to a point on what is known as Notch Mountain, where another signal house was built. Thus a line drawn from the centre of the pole

established on Row's Head, which lies several thousand feet east of the east portal, to the one on Notch Mountain would pass directly through the centre of those on the east and west summits of the Hoosac. From these, the portals of the tunnel were not visible; and, for that reason, the line was extended to the points named, as from these they could be readily seen. Now, the miner, for instance, at the west end, wanting a centre to work from, the same transit instrument being placed in position on Notch Mountain, the engineer draws a line from the pole on the west summit of the Hoosac down to the western portal, when another instrument point was established. As the tunnel advanced into the hill, it became necessary to extend this centre line into it, which was done by placing the transit in position at the point last named; from this point or centre were established, inside the tunnel, at intervals of twenty-five or thirty feet, by setting hard-wood plugs in the roof of the tunnel, into which were driven iron hooks, these being placed exactly in the centre of the tunnel line, after the tunnel had been pushed into the mountain so far that it was no longer possible to establish centres from the portal, by suspending a plummet line from the most advanced hook and another from the hook back of it, the transit being placed in position ahead of these, and, the engineer getting both in the line of his sight, readily established another point further ahead. In this manner, the lines were extended into the mountain, east and west, as the tunnel advanced, up to the time of meeting the central shaft headings.

The tunnel had brought out engineering work which in point of accuracy has not been approached on similar works either in this country or abroad. After the central shaft was sunk to grade in August, 1870, the question of how to project a centre line from the top of the mountain to the bottom of the shaft, 1,028 feet, became quite an important one, as it was quite essential that headings run east and west from the shaft meet exactly those coming from opposite directions. This was a work requiring much nicety and exactness, and there were employed some unusual devices entirely different from any heretofore used on similar works. They were originated and patented by Carl O. Wederkinch, engineer in charge of the central-shaft work, and have since been used on other tunnels, in California, with

equal success. Seventy-five feet from the shaft, on ether side of the tunnel, were instrument piers. From observations made at these points with a transit brought into exact line with the poles on the east and west summits, which, as I have before stated, represented the true tunnel line, it was found that, in projecting a line to a point nearer the shaft for the purpose of establishing another centre, observations made at different times would not agree. In consequence of which, it was found necessary to project lines, at different times, noticing their variation.

Twenty-five feet either side of the shaft, stone piers were built, on each of which were placed and securely fastened an instrument, consisting of slides, divided scales, motion screws, clamps, etc., for recording and establishing each and every line projected. A great number of lines were obtained; these were averaged and the mean computed; thus the true tunnel line was established at these points near the top of the shaft. The instruments above referred to being set on this line, two parallel steel wires were stretched across the shaft from one to the other, the intervening space of about a twentieth part of an inch, representing the line above referred to, exactly between these wires, not touching either, were suspended plummet wires of copper, on each side of the shaft, eleven and a half feet from the centre; to the end of these were attached plummets, weighing fifteen pounds each; these were suspended down the shaft about one thousand feet, the wires were encased in wooden boxes eight by eight, the plummet suspended in buckets of water for the purpose of protecting them from the disturbing influences of air currents and drops of water; thus shielded, the oscillation never exceeded 1-100 part of an inch.

The buckets stood on a floor, thrown across the shaft, two feet above the roof of the tunnel. Observations were made at different times, the oscillation of the wires on a scale placed in front of them carefully recorded; these were averaged, the mean computed, which was taken as the true tunnel line; thus two points or centres were established, near the bottom of the shaft, twenty-three feet apart. By suspending plummet lines from these two points into the tunnel directly below, the centre line, as the headings advanced east and west, was carried forward in the same manner as those at the east and west ends of the tun-

nel which I have already described. A communication from Consulting Engineer Edward S. Philbrick, published some time since in the "Boston Advertiser," develops some interesting facts in relation to the engineering work of the tunnel. He reproduces portions of a report written by one of the engineers upon the Mount Cenis Tunnel, in which the meeting of the two headings is there described. The two axes meet almost exactly; there was barely half a yard error; the level on our side was less than three quarters of a yard too high; but after thirteen years' continued work, who could even hope for so perfect a result?

The methods used in producing the lines at the Mount Cenis differed in some important details from those pursued at the Hoosac Tunnel, where the processes inaugurated by Thomas Doane have been followed out by his successor, Mr. Benjamin D. Frost. The superiority of the American plan is illustrated by a comparison of results. Thus, although the Mount Cenis Tunnel had advanced 20,000 feet before meeting, their error was half a yard, — eighteen inches, — or nearly one inch for every 1,000 feet advance, while we here found our largest error in line at the points of meeting to be only nine sixteenths of an inch in an advance into the mountain of 10,000 feet, which is a deviation of less than one sixteenth of an inch for a thousand feet advance, and therefore only one fifteenth of the angular deviation developed at the Mount Cenis. But with the great achievement of the Hoosac Tunnel by which Mr. Wederkinch laid a horizontal line with such accuracy from the bottom of a shaft over 1,000 feet deep, the Mount Cenis Tunnel can offer no comparison, being without shafts; and indeed Mr. Philbrick says, "This achievement is unique, and challenges comparison in its way, so far as I am informed." The Hoosac Tunnel, including the forty-four miles of railroad owned by the Commonwealth of Massachusetts, has cost the State, after adding the interest on the investment up to the present time (1877), about $17,000,000, a much larger sum than it would now cost to build it, after years of engineering experience in tunnelling, which was comparatively in its infancy when this work was begun, with improved methods by machine drills, more powerful explosives, simultaneous blasting by electricity, cheaper labor, etc.; yet, while the cost of the tunnel to the State has

been great, it is the opinion of many far-seeing railroad men that, if retained and properly managed by the Commonwealth until its value can be fairly estimated, it will be found to be worth to the State much more than it has cost. It is now under the control of the governor and Council, who employ the able and efficient manager, Jeremiah Prescott, to superintend and look after the interests of the State, both in the work of construction, which is now about completed, and in the operation of the road. The road is directly operated by the Fitchburg Railroad Company from Greenfield to North Adams, and by the Troy and Boston from North Adams to the State line, the State receiving a proportionate rate of the gross earnings. The business of the road is rapidly increasing, and bids fair to exceed the expectations of its most sanguine friends. The Hoosac Tunnel route is not only one of the most popular lines for passenger travel, but, from its easy grades and shorter distances, one of the best freight lines between the East and the West.

One of the best ways to visit the tunnel, for parties coming from the East, is to leave the cars at Greenfield; from there drive up through the charming Deerfield Valley to the east end of the tunnel; from this point the highway passes up through forests of birches and beaches to the eastern summit of the Hoosac, from which there is a grand outlook, to the eastward over the outlaying spurs of the mountain, the valley stream and railroad below. From this summit the road descends sharply into the high valley that stretches along the mountain top and runs through a dozen rocky farms, where the owners derive a good living from stock-growing and potato-raising. On the west slope of the valley, about one mile south of the main highway, is located the famed central shaft. Descending the western summit, however familiar one may be with the finest mountain scenery on the continent, he will exclaim with delight at the striking beauty of the scene that lies below and beyond. A lovely green valley contains the village of North Adams; the great, grayish-green hulk of Greylock Mountain, the highest peak in Massachusetts, rises across the valley, — these are the chief features of the picture whose charming details it would take long to describe.

ONLY A TUNNELLER.

BY E. A. WRIGHT.

"Only a tunneller" passing your door,
In the solemn hearse to-day;
Another bark from life's rough shore
Launched on the unknown bay.

"Only a tunneller" killed last night,
Blown up about twelve o'clock.
There 's no one to blame. The fellow was tight,
And could n't endure the shock.

"Only a tunneller," nothing more,
Gone to get his pay;
He ought to have given his notice before,
In a decent, sensible way.

Tom Lynch was known by all his gang
As one of the boys "that is tough,"
Which simply means, translated from slang,
A diamond yet in the rough.

Tom used to work on the first night shift,
And at twelve his work was done;
But often, to give his brother a lift,
He stayed in the shaft till one.

His brother Joe was a family man,
With children a dozen or more;
And they used to work on the mutual plan,
"To keep the wolf from the door."

Tom knew there was trouble ahead that night,
For the careless "glycerine cuss"
Had so "tamped" a hole that it would n't light,
Which always creates a fuss.

'T is a risky job to draw a charge
Of glycerine well "tamped" in;
For the man that tries it, the chance is large
That life will be brief for him.

Tom knew that the job had got to be done,
And that Joe would have it to do;
For Joe came to work with the gang at one,
And the shift was nearly due.

So the cage went up, leaving Tom alone
In the shaft, so dreary and dark.
A low, deep rumble: 't is all that 's known
Of the launch of the tunneller's bark.

Oh, good friend, did you stop to think,
Ere you uttered your heartless jest,
That in life's great chain this rusty link
Has held the very best.

For the tunneller's heart was true and brave,
And cherished no selfish thought;
And in giving his life another to save,
His mission he faithfully wrought.

I 've somewhere read, in days gone by,
That our life is at best but a span,
And the fittest place for a man to die
Is where he dies for man.

1878	Sund.	Mond.	Tues.	Wedn.	Thurs.	Friday	Satur.
Jan.			1	2	3	4	5
	6	7	8	9	10	11	12
	13	14	15	16	17	18	19
	20	21	22	23	24	25	26
	27	28	29	30	31		
Feb.						1	2
	3	4	5	6	7	8	9
	10	11	12	13	14	15	16
	17	18	19	20	21	22	23
	24	25	26	27	28		
Mar.						1	2
	3	4	5	6	7	8	9
	10	11	12	13	14	15	16
	17	18	19	20	21	22	23
	24	25	26	27	28	29	30
	31						
April.		1	2	3	4	5	6
	7	8	9	10	11	12	13
	14	15	16	17	18	19	20
	21	22	23	24	25	26	27
	28	29	30				
May.				1	2	3	4
	5	6	7	8	9	10	11
	12	13	14	15	16	17	18
	19	20	21	22	23	24	25
	26	27	28	29	30	31	
June.							1
	2	3	4	5	6	7	8
	9	10	11	12	13	14	15
	16	17	18	19	20	21	22
	23	24	25	26	27	28	29
	30						

1878	Sund.	Mond.	Tues.	Wedn.	Thurs.	Friday	Satur.
July.		1	2	3	4	5	6
	7	8	9	10	11	12	13
	14	15	16	17	18	19	20
	21	22	23	24	25	26	27
	28	29	30	31			
Aug.					1	2	3
	4	5	6	7	8	9	10
	11	12	13	14	15	16	17
	18	19	20	21	22	23	24
	25	26	27	28	29	30	31
Sept.	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
	29	30					
Oct.			1	2	3	4	5
	6	7	8	9	10	11	12
	13	14	15	16	17	18	19
	20	21	22	23	24	25	26
	27	28	29	30	31		
Nov.						1	2
	3	4	5	6	7	8	9
	10	11	12	13	14	15	16
	17	18	19	20	21	22	23
	24	25	26	27	28	29	30
Dec.	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
	29	30	31				

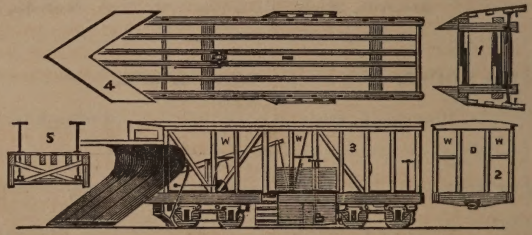
THE following named Hotels are located in the principal towns and cities on the ***Hoosac Tunnel Line*** and its connections, and can be relied upon as being first-class in every particular: —

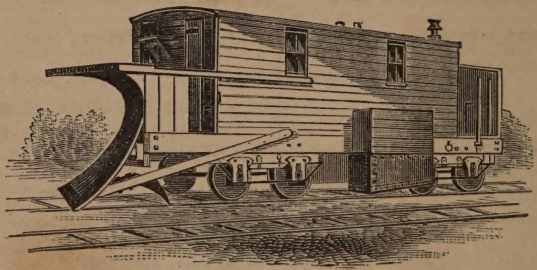
FALMOUTH HOTEL, **Portland, Me.**	**ROCKINGHAM HOUSE,** **Portsmouth, N. H.**
AMERICAN HOUSE, **Boston, Mass.**	**EAGLE HOUSE,** **Concord, N. H.**
CHESHIRE HOUSE, **Keene, N. H.**	**MERRIMACK HOUSE,** **Lowell, Mass.**
FRANKLIN HOUSE, **Lawrence, Mass.**	**NARRAGANSETT HOUSE,** **Fall River, Mass.**
PARKER HOUSE, **New Bedford, Mass.**	**HAYNES HOUSE,** **Springfield, Mass.**
AMERICAN HOUSE, **Fitchburg, Mass.**	**WILSON HOUSE,** **Northampton, Mass.**
BAY STATE HOUSE, **Worcester, Mass.**	**HOLYOKE HOUSE,** **Holyoke, Mass.**

OCEAN HOUSE, Newport, R. I.	ALDRICH HOUSE, Providence, R. I.
WAUREGAN HOUSE, Norwich, Ct.	ALLYN HOUSE, Hartford, Ct.
MOSLEY'S NEW HAVEN HOUSE, New Haven, Ct.	ATLANTIC HOTEL, Bridgeport, Ct.
ISLAND HOUSE, Bellows Falls, Vt.	BATES HOUSE, Rutland, Vt.
VAN NESS HOUSE, Burlington, Vt.	WELDEN HOUSE, St. ALBANS, Vt.
WINDSOR HOTEL, New York City.	UNITED STATES, Saratoga, N. Y.
GIRENS HOUSE, Schenectady, N. Y.	STANWIX HALL, Rome, N. Y.
ST. JAMES, Auburn, N. Y.	BAGGS HOTEL, Utica, N. Y.

GLOBE HOTEL, **Syracuse, N. Y.**	**OSBORN HOUSE,** **Rochester, N. Y.**
TIFT HOUSE, **Buffalo, N. Y.**	**SPAULDING HOUSE,** **Binghamton, N. Y.**
RUSSELL HOUSE, **Detroit, Mich.**	**BOODY HOUSE,** **Toledo, Ohio.**
KENNARD HOUSE, **Cleveland, Ohio.**	**NEIL HOUSE,** **Columbus, Ohio.**
BURNETT HOUSE, **Cincinnati, Ohio.**	**PALMER HOUSE,** **Chicago, Ill.**
PLUNKINTON HOUSE, **Milwaukee, Wis.**	**LINDELL HOTEL,** **St. Louis, Mo.**
GATT HOUSE, **Louisville, Ky.**	**QUEEN'S HOTEL,** **Toronto, Canada.**
ROYAL HOTEL, **Hamilton, Canada.**	**EMPIRE HOUSE,** **Akron, Ohio.**

HEYWOOD'S PATENT SNOW PLOW.





1. Application of Wings. 2. Tool House. 3. Caboose. 4. Application of Plow to Car. 5. Brake for Extending Wings.

HEYWOOD'S

Patent Snow Plow

FOR SINGLE OR DOUBLE TRACKS.

With Safety Wings and Flange Clearers; safe to run at full passenger train speed, leaving the track and flanges entirely free from ice and snow.

Reference may be made to the following Railroads, where they have been fully tested: Fitchburg, Vt. & Mass., Flushing & North Side, Flint & Pere Marquette, Chicago & Michigan Lake Shore, Inter-Colonial, Wisconsin Central, Boston, Clinton, Fitchburg & New Bedford, Boston, Barry, Gardner & Monadnock Railroads.

INDIANAPOLIS AND CINCINNATI RAILROAD.
MASTER MECHANIC'S OFFICE,
CINCINNATI, OHIO, Nov. 28, 1865.

MR. C. L. HEYWOOD, Boston, Mass.,—

Your letter requesting me to give an opinion relative to the merits of your Snow Plow and Scraper, is received. It affords me pleasure to say that while engaged on the Fitchburg Railroad I had an opportunity to examine it carefully, and witness its operation. It is the best machine I have ever seen, not only for clearing ice and snow from the track, but at the same time removing it deep enough so that the flanges suffer no impediment whatever. The great speed at which it can be run with perfect safety gives it an advantage over any other machine now used for that purpose. Its simplicity and durability render it a desirable machine for any railroad obstructed by snow or ice.

Yours truly,

H. M. BRITTON, *Master Mechanic.*

The following gentlemen fully concur in the above statements: G. A. COOLIDGE, Supt. of Motive Power; ENOS VARNEY, Supt. Car Depot; L. J. SPAULDING, Road Master, Fitchburg Railroad.

Arrangements made to have the Plows made at the Car Works of the different Railroads.

APPLY TO

C. L. HEYWOOD, Boston, Mass.

YOUNG'S HOTEL.

EUROPEAN PLAN.

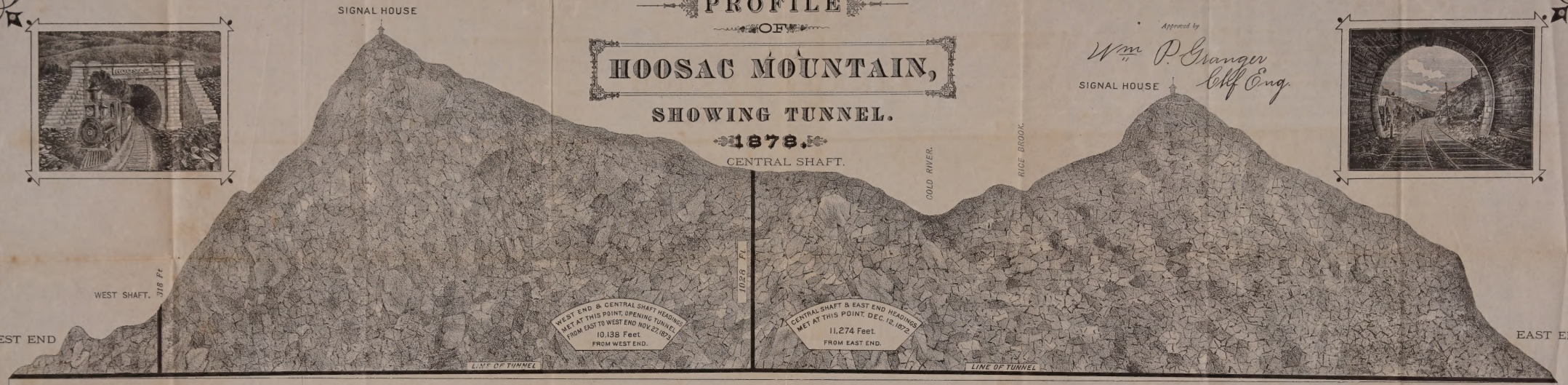
HEAD OF STATE ST., BOSTON MASS.

HALL & WHIPPLE, PROPRIETORS.

This favorite Hotel is unsurpassed in all its comforts, luxuries, and appointments. Situated in the heart of the business portion of the city, it offers superior inducements to the pleasure seeker, commercial traveler, tourist and business man.

GEO. A. HALL. J. B. WHIPPLE.

PROFILE OF HOOSAC MOUNTAIN, SHOWING TUNNEL. 1878.


SIGNAL HOUSE
SIGNAL HOUSE
CENTRAL SHAFT.
COLD RIVER.
RICE BROOK.
WEST SHAFT.
318 Ft
1028 Ft
WEST END
EAST END.
WEST END & CENTRAL SHAFT HEADINGS MET AT THIS POINT, OPENING TUNNEL FROM EAST TO WEST END NOV. 27, 1873.
10,138 Feet FROM WEST END.
CENTRAL SHAFT & EAST END HEADINGS MET AT THIS POINT. DEC. 12, 1872.
11,274 Feet. FROM EAST END.
LINE OF TUNNEL
LINE OF TUNNEL

Approved by
Wm P. Granger
Chf Eng.

FROM WEST END TO CENTRAL SHAFT, 12,244 FEET. | TOTAL LENGTH, 25,081 FEET. | FROM CENTRAL SHAFT TO EAST END, 12,837 FEET.

Grade at Portals, 786 feet above tide water.
Grade per mile from Portals to Central Shaft, 26.40 feet.
Road chartered in 1848.
First work of Tunneling commenced, 1851.
Opened by Commonwealth of Massachusetts up to beginning of Shanly contract, January, 1869. East end, 5,283 feet. West end, 4,055 feet. Central Shaft sunk 583 feet.
Total length of Tunnel opened by F. Shanly & Co., Montreal, 13,743 feet.
Surveys made and present Tunnel line established by Thos. Doane, C. E., in 1863.

Distance from Boston to Tunnel,	136 miles.
" through Tunnel,	4¼ "
" from Tunnel to Troy,	50 "
Total from Boston to Troy,	191 "

ENGINEERS EMPLOYED BY COMMONWEALTH OF MASSACHUSETTS, DURING SHANLY CONTRACT.

Chief Engineer: B. D. FROST.

Chief Assistants:
F. D. FISHER, in charge at West End.
A. W. LOCKE, " " " East End.
C. O. WEDERKINCH, " " " Central Shaft.

HOOSAC TUNNEL.

LOCATED IN NORTHWESTERN MASSACHUSETTS, ON LINE OF TROY AND GREENFIELD R.R. CONSTRUCTED BY COMMONWEALTH OF MASSACHUSETTS

Manager,	J. PRESCOTT.
Chief Engineer,	W. P. GRANGER.
Treasurer,	AUSTIN BOND.
Secretary,	EWD. HAMILTON.

Designed and Published by Edward S. Martin, North Adams, Mass.

Total length of Brick Arching,	7,673 feet.
Average thickness of Arch, 6 rings, or	2 "
West Summit above Tunnel,	1,718 "
East " " "	1,429 "

First Train of Cars passed through Tunnel, Feb. 9, 1875.
First Passenger Train passed through Tunnel from Boston to Troy, Oct. 13, 1875.
First through freight from the West, consisting of 22 car loads of grain, passed through Tunnel April 5, 1875, over Fitchburg Railroad, consigned to J. Cushing & Co., Fitchburg, Mass.

Depth of Central Shaft,	1,028 feet.
Depth of West Shaft,	318 "

West Shaft partly filled.
Central Shaft remaining open for purpose of ventilating Tunnel.
Size of West Shaft, 10-14. Size of Central Shaft, 13-27.
Amount of Water running through Drain out West End of Tunnel, 800 Gallons per minute.
Amount of Water running through Drain out East End of Tunnel, 100 Gallons per minute.
The principal explosive employed was Tri-Nitro Glycerine, of which 434,758 lbs. were used during Shanly contract.

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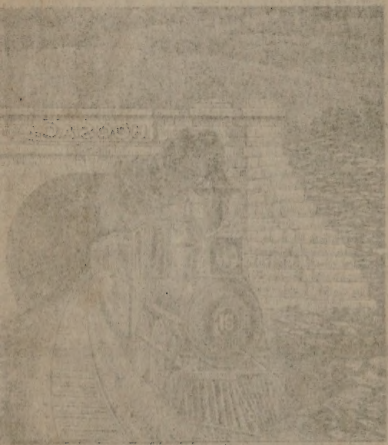
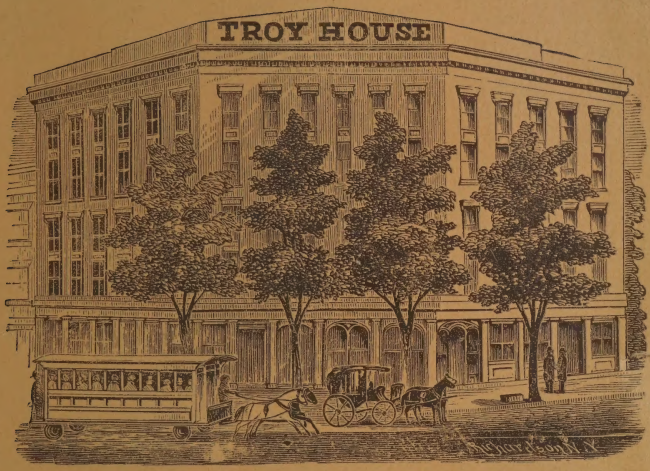
Forbes Co. Boston.





TROY HOUSE, Troy, N. Y. The leading and only first-class house in the city, refurnished. Tables supplied with delicacies in their season Courteous employes all striving to please and make at home the guests of the house. Free 'Bus to and from the house. H. W. STEARNS, Proprietor.

MANSION HOUSE, Greenfield, Mass. G. T. C. HOLDEN, Proprietor. This House, which is entirely new-furnished and renovated throughout, offers superior inducements to the traveling public.

E. B. RICHARDSON,

Merchant Tailor,

AND

GENTS' FURNISHER,

Main St., North Adams, Mass.

WILLIAM MARTIN,

DEALER IN

BOOTS, SHOES AND RUBBERS,

No. 3 STATE STREET,

Next door to C. H. CUTTING'S. } NORTH ADAMS, MASS.